

## CLAIMS

1. An automated method of scoring Oestrogen and Progesterone Receptors expression (ER and PR) from image data obtained from histological slides characterised in that it includes determining the number of relatively dark image pixels compared to relatively bright image pixels and scoring ER or PR in accordance with the magnitude of the number of relatively dark pixels.
2. A method according to Claim 1 characterised in that the number of relatively dark image pixels is determined by transforming the image data to a different image space having an intensity image plane and counting the number of pixels having intensities below a predetermined intensity threshold.
3. An automated method of scoring ER and PR from image data obtained from histological slides characterised in that it includes the steps of:
  - a) determining the number of pixels in an image having relatively dark intensities compared to other pixels in an image,
  - b) determining pixel number thresholds to quantify scoring, and
  - c) comparing the number of relatively dark pixels with the thresholds and scoring ER or PR in accordance therewith.
4. An automated method of scoring ER and PR from image data obtained from histological slides characterised in that it includes the steps of:
  - a) determining what proportion of total blob area is brown blob area in an image,
  - b) determining brown blob area proportion thresholds to quantify scoring, and
  - c) comparing the brown blob area proportion with the thresholds and scoring ER or PR in accordance therewith.
5. A method according to Claim 4 characterised in that the proportion of total blob area which is brown blob area is determined by the steps of:

- a) remapping pixel intensities in the image data to increase the contrast of relatively darker image regions and to transform relatively brighter image regions into a contrast-free background,
  - b) converting the remapped image data into thresholded binary images from which total blob area and brown blob area are discernible respectively, and
  - c) expressing brown blob area as a proportion of total blob area.
6. A method according to Claim 3 characterised in that the step of scoring ER or PR provides a first contribution thereto and the method includes:
- a) providing a second contribution to scoring ER or PR by determining the number of relatively dark image pixels compared to relatively bright image pixels and deriving the second contribution in accordance with the magnitude of the number of relatively dark pixels, and
  - b) combining the first and second contributions.
7. A method according to Claim 6 characterised in that the number of relatively dark image pixels is determined by transforming the image data to a different image space having an intensity image plane and counting the number of pixels having intensity below a predetermined intensity threshold.
8. An automated method of scoring ER and PR for image data obtained from histological slides characterised in that it includes the steps of:
- a) remapping pixel intensities in the image data to increase the contrast of relatively darker image regions and to transform relatively brighter image regions into a contrast-free background,
  - b) converting the remapped image data into thresholded images in which total blob area and brown blob area respectively are distinguished from other image regions,
  - c) expressing brown blob area as a proportion of total blob area to provide a first contribution to a score,
  - d) providing a second contribution to the score by determining the number of relatively dark image pixels compared to relatively bright image pixels and

- deriving the second contribution in accordance with the magnitude of the number of relatively dark pixels, and
- e) deriving the score on the basis of the first and second contributions collectively.
9. A method according to Claim 8 characterised in that it includes determining a hue for the image data and deriving a correction for the score indicated by the first and second contributions if the hue indicates a degree of blueness or brownness which renders such correction appropriate.
10. Computer apparatus for scoring ER and PR from image data obtained from histological slides characterised in that it is programmed to determine the number of relatively dark image pixels compared to relatively bright image pixels and to score ER or PR in accordance with the magnitude of the number of relatively dark pixels.
11. Apparatus according to Claim 10 characterised in that it is programmed to determine the number of relatively dark image pixels by transforming the image data to a different image space having an intensity image plane and counting the number of pixels having intensities below a predetermined intensity threshold.
12. Computer apparatus for scoring ER and PR from image data obtained from histological slides characterised in that it is programmed to:
- determine the number of pixels in an image having relatively dark intensities compared to other pixels in an image,
  - determine pixel number thresholds to quantify scoring, and
  - compare the number of relatively dark pixels with the thresholds and scoring ER or PR in accordance therewith.
13. Computer apparatus for scoring ER and PR from image data obtained from histological slides characterised in that it is programmed to:
- determine what proportion of total blob area is brown blob area in an image,
  - determine brown blob area proportion thresholds to quantify scoring, and

- c) compare the brown blob area proportion with the thresholds and scoring ER or PR in accordance therewith.
- 14. Apparatus according to Claim 13 characterised in that it is programmed to determine the proportion of total blob area which is brown blob area by:
  - a) remapping pixel intensities in the image data to increase the contrast of relatively darker image regions and to transform relatively brighter image regions into a contrast-free background,
  - b) converting the remapped image data into thresholded binary images from which total blob area and brown blob area are discernible respectively, and
  - c) expressing brown blob area as a proportion of total blob area.
- 15. Apparatus according to Claim 12 characterised in that it is programmed to score ER or PR as a first contribution thereto, and it is also programmed to:
  - a) provide a second contribution to scoring ER or PR by determining the number of relatively dark image pixels compared to relatively bright image pixels and deriving the second contribution in accordance with the magnitude of the number of relatively dark pixels, and
  - b) combine the first and second contributions.
- 16. Apparatus according to Claim 15 characterised in that it is programmed to determine the number of relatively dark image pixels by transforming the image data to a different image space having an intensity image plane and counting the number of pixels having intensity below a predetermined intensity threshold.

17. Computer apparatus for scoring ER and PR from image data obtained from histological slides characterised in that it is programmed to:
  - a) remap pixel intensities in the image data to increase the contrast of relatively darker image regions and to transform relatively brighter image regions into a contrast-free background,
  - b) convert the remapped image data into thresholded images in which total blob area and brown blob area respectively are distinguished from other image regions,
  - c) express brown blob area as a proportion of total blob area to provide a first contribution to a score,
  - d) provide a second contribution to the score by determining the number of relatively dark image pixels compared to relatively bright image pixels and deriving the second contribution in accordance with the magnitude of the number of relatively dark pixels, and
  - e) derive the score on the basis of the first and second contributions collectively.
18. Apparatus according to Claim 17 characterised in that it is programmed to determine a hue for the image data and derive a correction for the score indicated by the first and second contributions if the hue indicates a degree of blueness or brownness which renders such correction appropriate.
19. A computer programme for scoring ER and PR from image data obtained from histological slides characterised in that it includes instructions for determining the number of relatively dark image pixels compared to relatively bright image pixels and scoring ER or PR in accordance with the magnitude of the number of relatively dark pixels.
20. A programme according to Claim 19 characterised in that it includes instructions for determining the number of relatively dark image pixels by transforming the image data to a different image space having an intensity image plane and counting the number of pixels having intensities below a predetermined intensity threshold.

21. A computer programme for scoring ER and PR from image data obtained from histological slides characterised in that it includes instructions for:
  - a) determining the number of pixels in an image having relatively dark intensities compared to other pixels in an image,
  - b) determining pixel number thresholds to quantify scoring, and
  - c) comparing the number of relatively dark pixels with the thresholds and scoring ER or PR in accordance therewith.
22. A computer programme for scoring ER and PR from image data obtained from histological slides characterised in that it includes instructions for:
  - a) determining what proportion of total blob area is brown blob area in an image,
  - b) determining brown blob area proportion thresholds to quantify scoring, and
  - c) comparing the brown blob area proportion with the thresholds and scoring ER or PR in accordance therewith.
23. A programme according to Claim 22 characterised in that it includes instructions for determining the proportion of total blob area which is brown blob area by:
  - a) remapping pixel intensities in the image data to increase the contrast of relatively darker image regions and to transform relatively brighter image regions into a contrast-free background,
  - b) converting the remapped image data into thresholded binary images from which total blob area and brown blob area are discernible respectively, and
  - c) expressing brown blob area as a proportion of total blob area.
24. A programme according to Claim 21 characterised in that the instructions for scoring ER or PR are for providing a first contribution thereto and it also includes instructions for:
  - a) providing a second contribution to scoring ER or PR by determining the number of relatively dark image pixels compared to relatively bright image pixels and deriving the second contribution in accordance with the magnitude of the number of relatively dark pixels, and
  - b) combining the first and second contributions.

25. A programme according to Claim 24 characterised in that it includes instructions for determining the number of relatively dark image pixels by transforming the image data to a different image space having an intensity image plane and counting the number of pixels having intensity below a predetermined intensity threshold.
26. A computer programme for scoring ER and PR from image data obtained from histological slides characterised in that it includes instructions for implementing the steps of:
- a) remapping pixel intensities in the image data to increase the contrast of relatively darker image regions and to transform relatively brighter image regions into a contrast-free background,
  - b) converting the remapped image data into thresholded images in which total blob area and brown blob area respectively are distinguished from other image regions,
  - c) expressing brown blob area as a proportion of total blob area to provide a first contribution to a score,
  - d) providing a second contribution to the score by determining the number of relatively dark image pixels compared to relatively bright image pixels and deriving the second contribution in accordance with the magnitude of the number of relatively dark pixels, and
  - e) deriving the score on the basis of the first and second contributions collectively.
27. A programme according to Claim 26 characterised in that it includes instructions for determining a hue for the image data and deriving a correction for the score indicated by the first and second contributions if the hue indicates a degree of blueness or brownness which renders such correction appropriate.